

First School Year

HARDNESS TESTS

There are many types of *hardness* tests.

1. The most important are *penetration* tests. There are 3 types of these tests.

1.1 Rockwell test

We *press* a diamond *cone* into the material. The angle of this *cone* is 120° . Or we can use a steel ball instead of the *cone*. The level of *hardness* is the size of the plastic deformation. We do this test on a Rockwell *hardness* tester.

There are the following advantages:

- the test is quick to do
- the test is easy to do
- the test is *suitable for* checking large product series

There is one important disadvantage:

- it has lower *accuracy*

1.2 Brinell test

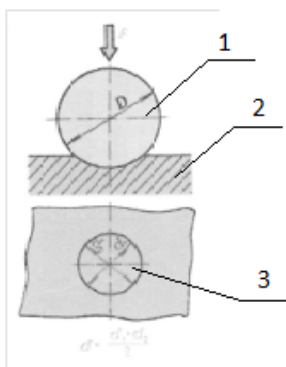
We *press* a *hardened* steel ball into the surface of the test material. We do it on a Brinell *hardness* meter.

There is one disadvantage to this test:

- the *imprint* is not *clear* to measure

In the following Picture 1 you can see the Brinell test for testing soft materials.

Picture 1 - Brinell test - example



- 1 ... *pressed* ball
- 2 ... test material
- 3 ... *sprint* with *diameters* d_1, d_2

For calculating the **hardness** we use **diameters** d_1 and d_2 (see above).

1.3 Vickers test

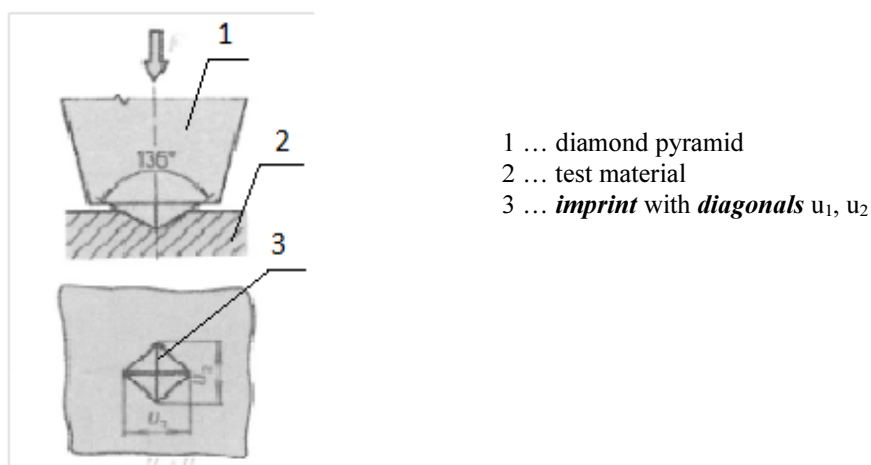
We **press** a regular diamond pyramid into the surface of the test material. The pyramid has a top angle of 136° .

The advantages of this test are:

- it is very **accurate**
- we can use it for all materials

In the following Picture 2 you can see a diagram of the Vickers test.

Picture 2 - Vickers hardness test



For calculating the **hardness** we use **diagonals** u_1 and u_2 (see above).

VOCABULARY

| | |
|---------------------|--------------------|
| accuracy | přesnost |
| accurate | přesný, správný |
| clear | jasný |
| cone | kužel |
| diagonal | úhlopříčka |
| diameter | průměr |
| hardened | ztvrdlý |
| hardness | tvrdost |
| imprint | vtisk |
| penetration | vnikání, penetrace |
| press | stlačit, stlačení |
| suitable for | vhodný pro |

COMPREHENSION QUESTIONS

1. What are the most important hardness tests?
2. What types of penetration tests do you remember from the text?
3. What do we press into the material in the Rockwell test?
4. What are the advantages and disadvantage of the Rockwell test?
5. What do you know about the Brinell test?
6. What are the advantages of the Vickers test?

EXERCISES

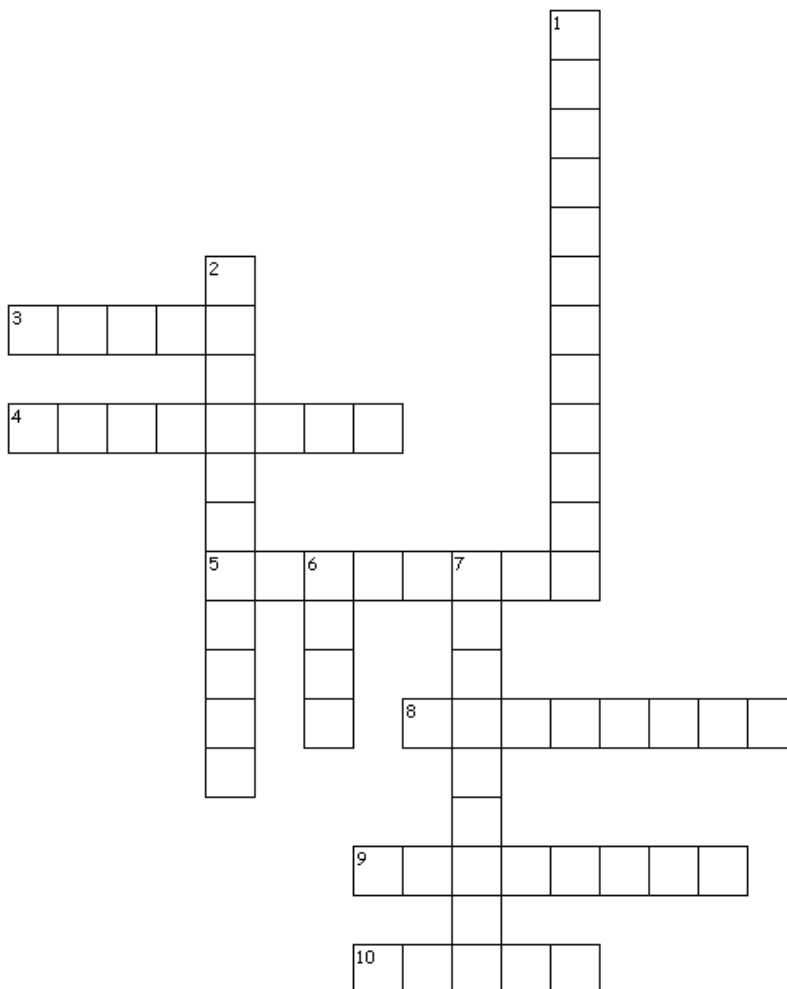
1. Criss Cross Puzzle - 10 words were placed into the puzzle.

Across

- 3. úhel
- 4. průměr
- 5. přesný
- 8. tvrdost
- 9. úhlopříčka
- 10. stlačit

Down

- 1. nevýhoda
- 2. vnikání, penetrace
- 6. kužel
- 7. výhoda



2. Find grammatical and spelling mistakes in the sentences. Correct the sentences.

- 1) The importantest are penetration tests.
- 2) We can use a stell ball instead of the cone in Rockwell test.
- 3) The Rockwell test is qiuck and esy do do.
- 4) The Rockwell test is suitable in checking large product series.
- 5) In Brinell test we press a hardend steel ball into the surface of the test material.
- 6) The diamond pyramid have a top angle of 130°.

EXERCISES – KEY FOR TEACHERS

1. Criss Cross Puzzle

Across

- 3. úhel - angle
- 4. průměr - diameter
- 5. přesný - accurate
- 8. tvrdost - hardness
- 9. úhlopříčka - diagonal
- 10. stlačit - press

Down

- 1. nevýhoda - disadvantage
- 2. vnikání, penetrace - penetration
- 6. kužel - cone
- 7. výhoda - advantage

2.

- 1) ~~The important~~ **most important** are penetration tests.
- 2) We can use a ~~steel~~ **steel** ball instead of the cone in Rockwell test.
- 3) The Rockwell test is ~~quick~~ **quick** and easy to do.
- 4) The Rockwell test is suitable ~~in~~ **for** checking large product series.
- 5) In Brinell test we press a ~~hardend~~ **hardened** steel ball into the surface of the test material.
- 6) The diamond pyramid ~~have~~ **has** a top angle of 130°.